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Design Criteria Information System

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# Design Criteria Information System: An Online System for the Timely Distribution of Army Design Criteria

by
William H. Flickinger
Jane Solon-Wetmore

To help control facility construction costs and quality, the U.S. Army Corps of Engineers (USACE) publishes Architectural and Engineering Instructions (AEIs)—a category of design criteria and guidance for Engineer Districts and the architect/engineer (A/E) firms that work for the Corps on contract. AEIs are revised frequently, and the conventional publication system cannot reliably provide the A/E with the most current design criteria. When outdated criteria are used, the resulting contract modifications cost the Corps money and time. The U.S. Army Construction Engineering Research Laboratory (USACERL) was tasked to develop an online system that would reliably give the AEI end user direct access to the most current AEI design criteria available. The product of this work is the Design Criteria Information System (DCIS).

This report documents DCIS system requirements, concepts, and characteristics. Possible directions for system enhancement are also discussed.

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This report documents DCIS system requirements, concepts, and characteristics. Possible directions for system enhancement are also discussed.

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## FOREWORD

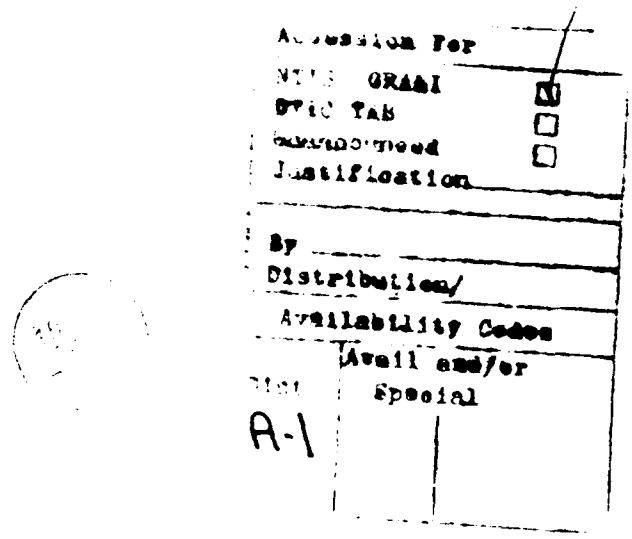
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The work was performed by the U.S. Army Construction Engineering Research Laboratory Facility Systems Division (USACERL-FS), Military Programs Analysis Team (MPAT). The USACERL principal investigator was Mr. William H. Flickinger and the assistant investigator was Ms. Jane Solon-Wetmore. Mr. Jeff Cath and Mr. Jim Jou of McClendon Automation, Fairfax, VA participated in development of DCIS. Ms. Janet Spoonamore is MPAT team leader, and Dr. Michael J. O'Connor is Chief of FS. The USACERL technical editor was Gordon L. Cohen, Information Management Office.

COL Everett R. Thomas is Commander and Director of USACERL, and Dr. L.R. Shaffer is Technical Director.

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# DESIGN CRITERIA INFORMATION SYSTEM: AN ONLINE SYSTEM FOR THE TIMELY DISTRIBUTION OF ARMY DESIGN CRITERIA

## 1 INTRODUCTION

### Background

To help control facility construction costs and quality for military construction projects, Headquarters, U.S. Army Corps of Engineers (HQUSACE) publishes Architectural and Engineering Instructions (AEIs)—a category of design criteria and guidance for Corps of Engineers Districts and the architect/engineer (A/E) firms that work for the Corps on contract. AEIs direct the designer to current guidance published by the Corps and the Department of Defense (DOD), but they also contain specific design criteria. In addition to being a resource for the designer, AEIs are used in the planning, programming, and management of Corps construction projects.

AEIs comprise a complex set of information that have traditionally been published and distributed as paper documents. They are published in two volumes: one is divided into appendixes covering 11 specific types of facilities; the other is dedicated to criteria for medical facilities. A factor contributing to the complexity of AEIs as a category of publication is that the guidance does not apply uniformly to every location worldwide: there are often different criteria for the continental United States (CONUS), the Far East, and Europe. The combined set of unabridged AEIs, including all regional criteria variations, fills more than 1500 printed pages and is published periodically through the Government Printing Office and other printing services. In an effort to control the cost of printing and handling this unwieldy body of information, AEIs are given a relatively narrow distribution.

There are two basic problems with the conventional system of publishing and distributing AEIs. First, the documents are never directly distributed to the end user, and this often poses problems since the use of AEIs is required. After the A/E deals with the inconvenience of obtaining the required AEI, a second problem often arises: the AEI is frequently out of date. AEI criteria are frequently updated, and these updates are published quarterly by the Corps in Engineer Technical Letters (ETLs). However, ETLs are often filed separately from whatever AEI source the end user has access to, so the A/E may not be aware that an update exists. He or she may unintentionally use outdated design information. This often costs the Corps time and money due to the later design modifications required to bring the work into compliance with the current AEI.

A staff architect in the engineering division of HQUSACE developed a plan of action and cost estimate for using a computer network as a reliable, timely way to disseminate AEIs. This would avoid the problems arising from the use of outdated design criteria. HQUSACE tasked the U.S. Army Construction Engineering Research Laboratory (USACERL) with assisting the architect as the technical expert in development of this new system. The result of this research was the Design Criteria Information System (DCIS), an online source for the most current AEIs, with potential applications for many other categories of design criteria and guidance.

## Objective

The objective of this research was to develop a system for making the most current AEIs readily available to the end user in the most timely manner feasible. It was required that end users would have read-only access only to those AEIs applying to the region in which their project would be located.

The purpose of this report is to document the features of the resulting system—DCIS—and to discuss features that are being investigated or considered for future program upgrades.

## Approach

It was determined that the Corps' Programming, Administration, and Execution (PAX) data processing system would be the logical environment for which to develop DCIS. Anyone with a PAX logon identification (PAXID) can access PAX using a standard DOS*-compatible microcomputer with at least 512 kilobytes of memory, a hard disk, a video monitor, and a modem. Upon defining the major development objective and selecting the host environment, specific system requirements were identified and incorporated into program design. A contractor was retained to develop the program code and document the system. The contractor was required to develop a nonproprietary system so the Corps would not become dependent on a single vendor for system maintenance and support.

The main body of this report discusses system requirements and the DCIS capabilities that address them.

## Scope

DCIS is not intended to replace the Army's published edition of the AEIs or other official design criteria publications. The hardcopy published version of the AEIs, which includes all associated drawings, remains the official Army version of this guidance. Similarly, DCIS is not intended to compete with non-Army design criteria systems such as the Construction Criteria Base (CCB). Instead, DCIS is intended to complement these other sources of design information. Its main purpose, which is not addressed by these other sources of design information, is to disseminate the most up-to-date version of AEI *text* to the end user in the field on a timely basis.

Most AEI updates affect text rather than drawings: an update in text does not necessarily require the updating of an associated drawing. Therefore, the first priority in developing DCIS was to create a system that would effectively update and distribute AEI text. DCIS users may receive copies of updated AEI diagrams and drawings, but these are provided on paper through the mail, not as an online service. Online updating and distribution of drawings will be addressed in future upgrades of DCIS.

## Mode of Technology Transfer

DCIS is available through the PAX system. Users may obtain a PAXID by contacting the PAX Administrator at the Army installation, USACE major subordinate command (MSC), or field operating activity with which they are working. Access to DCIS is obtained when the user selects the PAX services he or she requires. There is no software for the user to maintain or update. Access to the most current AEIs is available transparently via the PAX and DCIS user menu systems.

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*DOS=disk operating system, the widely used operating environment for IBM® microcomputers and compatibles.

# 2 DCIS REQUIREMENTS, CONCEPTS, AND SYSTEM DESIGN

## System Host Environment

The first step in the development of DCIS was the decision to create it as a program for the Corps' PAX system. PAX is an integrated data processing system that tracks all aspects of military construction projects from "cradle to grave." PAX is available worldwide and has been online since 1982.

Each PAX subsystem performs a specific function that must be accomplished throughout the life cycle of a facility. Data are recorded and tracked through the installation commander's initial request, Major Army Command (MACOM) review and approval, the President's budget, Congressional authorization and appropriation, design and construction, operation and maintenance (O&M), and disposal.

PAX resources consist of a commercial timesharing computer system, government-furnished applications software, and a worldwide telecommunications network. The telecommunications network links military engineers, their headquarters, and project administrators to a comprehensive database for each individual facility throughout its complete life cycle. More than 1800 users are registered to log onto PAX. Users have access to whatever PAX applications they need to fulfill their mission-support role.

An important aspect of the PAX system concept is the "pay as you go" approach. This is intended to have two effects: (1) users will be aware of the costs of using PAX, leading them to use the system efficiently, and (2) users will demand efficiency and economy in the applications they are paying for, so they will not use unduly expensive or inefficient ones. Each PAX application is supported by a proponent and an assigned responsible agency (ARA), and the cost of using PAX is billed back to the user. However, no surcharge is assessed for the operation and maintenance of PAX. A PAX application must recover its operating costs from its users, without subsidy from any other application (with the exception of development costs, which are funded by HQUSACE).

Because it is an automated system, PAX can provide Army engineers with support worldwide on an around-the-clock basis seven days a week. It runs on an IBM 370/3083JX computer that uses the Conversational Monitor System (CMS), a multiprogramming, multiprocessor, network-oriented operating system. These system characteristics, as well as those previously cited, offered the best platform available for implementation of DCIS.

Figure 1 illustrates the basic DCIS architecture and information flow within the PAX environment. For more information on PAX, refer to *PAX Usage Procedures* (McClendon Automation, March 1988) and *The PAX System Overview* (HQUSACE, December 1987).

## Basic DCIS Functions

HQUSACE developed the concepts and plans for DCIS. USACERL worked on the technical requirements and system design with a private-sector automation support and development company.

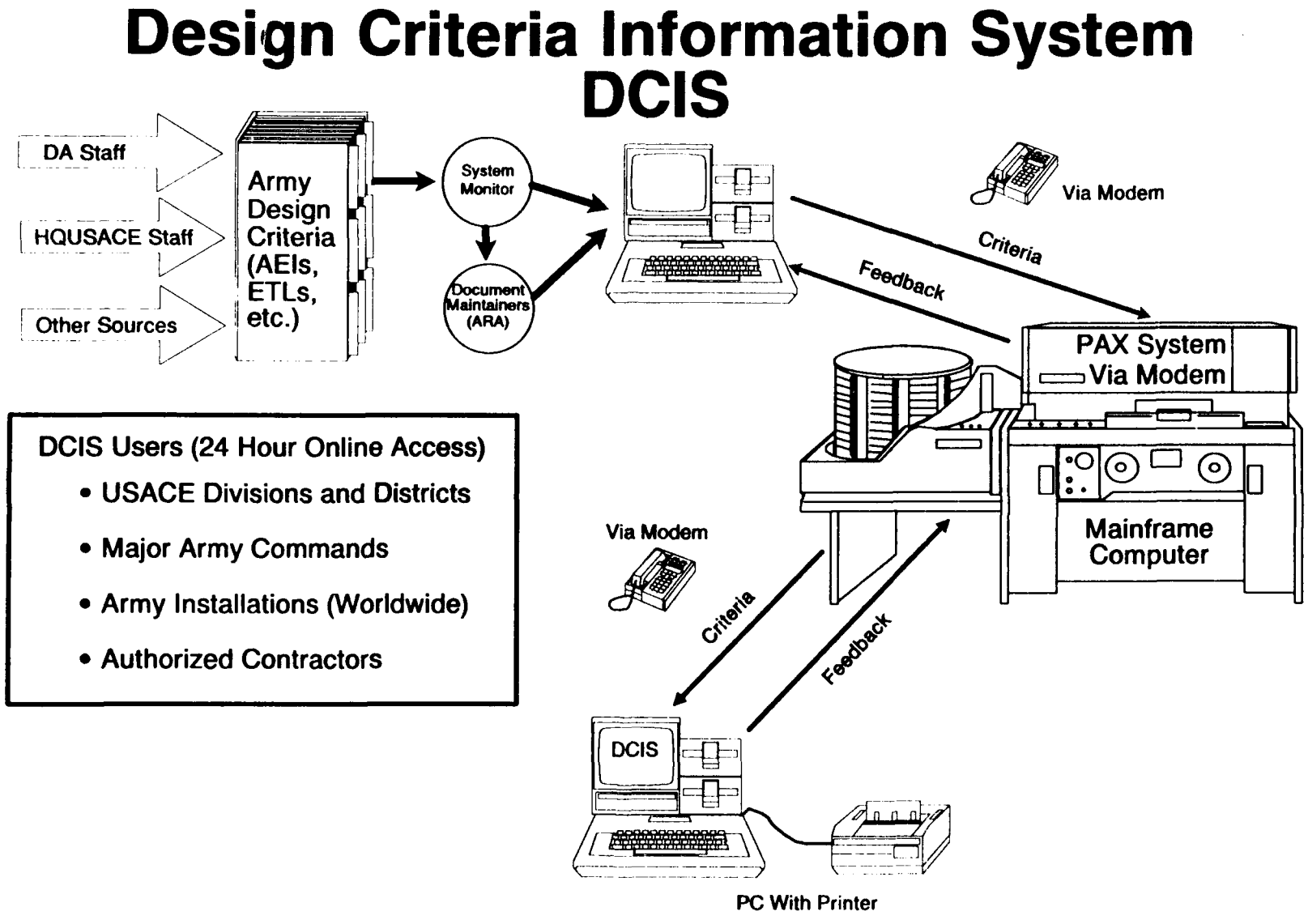



Figure 1. DCIS system architecture and information flow.

DCIS fulfills three major functions:

1. Worldwide online read-only access to the AEIs
2. Document maintenance (updates, deletions, and corrections) of AEIs
3. System Monitor capabilities, including control of access by users.

Each major function listed above targets the needs of distinct user groups. Each function is menu-driven, for ease of user access. Where required or appropriate (depending on the function), the system uses a prompt/response process for conversation with the user.

*Read-Only Access*

The read-only function primarily addresses the needs of the system's ultimate end user—the Army engineer or a contractor A/E firm doing design work for the Corps. The term "read-only" refers to the type of data access granted to DCIS end users: they may only "read" an AEI from the DCIS database, which essentially copies it from PAX into the random access memory (RAM) of the user's microcomputer or workstation. However, users with read-only access cannot write data to any AEI file, so design criteria cannot be corrupted either by user error or design. The read-only functions allow end users to review and print a DCIS document in its entirety (or in sections) from a local workstation.

It should be noted that these read-only functions do not completely prohibit input by end users. System users can send suggestions and queries to the DCIS System Monitor via a communications feature called the Suggestion Box.

*Document Maintenance*

These functions enable the DCIS System Monitor to designate specific users as document maintainers. A document maintainer is authorized (and has "write" access) to edit the text of specific AEIs, to annotate what has changed and when it changed, and upload documents (or portions of documents). A user may invoke document maintainer functions only by (1) having a valid document-maintainer PAXID and (2) by being granted access to particular documents specified by the System Monitor.

The document maintenance functions are the means by which AEIs and other design criteria are kept current. Updates and new criteria are made available online by the document maintainer as soon as they are approved. This is in contrast to the conventional system of publishing design criteria in printed editions, through which updates might not be available to the end user for at least 3 months, depending on printing and distribution schedules. Timely, widespread distribution of frequently changed criteria can be considered the central benefit of DCIS, and the one that makes it unique among all other sources of design criteria. This important benefit is implemented on a day-to-day basis via the document maintainer functions.

*System Monitor*

The System Monitor functions allow any DCIS user designated as System Monitor to track, review, analyze, and control access to DCIS. By having the highest level of access to DCIS, a System Monitor can control all facets of the system. Important System Monitor functions include:

1. Designation of valid DCIS users and their level of access
2. Preparation of system-use audit reports

3. Review and implementation of user comments from the suggestion box
4. Ability to add new menus and documents to the DCIS Document Profile Table.

The CMS operating environment for DCIS includes three linked fixed disks. This results in a segmentation of DCIS system data and functions that allows the System Monitor to control read and write access. As previously indicated, it effectively eliminates the risk of corrupting DCIS text while allowing users write access via the Suggestion Box.

## System Concepts and Features

*Access*

DCIS is accessible by any registered PAX user in the read-only mode. Although the read-only mode is essential because it prevents unauthorized changes to DCIS data, there are occasions when particular users may need write access. The System Monitor can grant one-time write access, or other exceptions to "read-only" as necessary. For example, write access may be granted to a user responsible for updating a portion of an AEI.

The System Monitor can interactively designate any DCIS user as a maintainer of any specified portion of any document. The System Monitor may also add new users to the system who have restricted read-only access. For example, a private-sector A/E firm doing work for the Army may be given read-only access to very limited portions of a single AEI. Many MSCs and FOAs use this feature when working with local firms involved in some aspect of a design project. This type of access control functions as a security measure for protecting data files, databases, and software. DCIS includes other security measures, as well.

*Format*

Whenever a user logs on, DCIS posts a welcome message that describes the DCIS system and instructions on the use of the read-only functions. It offers users an option to bypass the welcome message and allows the System Monitor to override the bypass feature. After reading or bypassing the welcome message, the user is presented the DCIS System Menu. By selecting the AEI Access Menu from the System Menu, the user may access the following: AEI table of contents, foreword, title page, chapter, appendixes, and acronym list. Access is available both through print and browse options, as discussed in the section on Menus that follows.

As indicated previously, the same AEI criteria do not apply worldwide. AEIs are categorized into three sets: CONUS, Far East, and Europe. Criteria established for CONUS may not (or may) apply outside the continental United States (OCONUS). An individual using the printed AEI documents as guidance must decide which criteria apply to the project location. DCIS automates this decision, however, eliminating the possibility that the wrong criteria will be used. It is assumed that a DCIS user registered to access the AEIs for Europe, for example, would not require AEIs pertaining to the Far East or CONUS. Thus, a user designing a facility for Germany is given access only to AEIs pertaining to Europe. This concept of basing access on the design project's geographic location applies to all typical DCIS end users.

*Menus*

DCIS employs a menu-driven interface for ease of use, allowing the user to choose between options presented on the screen rather than inputting instructions from a text-driven command line. Examples of user options include reading an AEI, reading an applicable ETL, using the Suggestion Box, etc. Table 1 lists all documents accessible by users through DCIS menus.

Menus are standardized to help make it easy for the user to navigate the system. User exits allow for return to the PAX environment from submenu levels within DCIS. The Appendix to this report includes a tour of the DCIS menu system in which the relationships among DCIS menus, submenus, and the PAX environment are illustrated.

After logging on to PAX, the user will see the menu item Design Criteria Information System displayed in the PAX menu. When that menu item is selected, DCIS automatically identifies the user, via his or her PAXID, and the access specifications for which that user is registered.

**Table 1**

**Documents Available in DCIS**

*Design Criteria*
- Design Criteria AEI
- Medical Design Standards (MDS) AEI
- ETL 1110-1-136, Fragment Retention Film for Glass
- ETL 1110-3-392, Entry Point/Access Control Points
- Bullet and Forced Entry Resistant Window Design
- Index of Design Drawings for Military Construction (draft)

*Document Change Notification*
- AEI revised chapters notification
- New document SOP added notification
- AEI appendices added notification
- Engineering Technical Letter added to DCIS
- Medical Design Standards AEI
- New document MDS added notification
- ETL Update 1110-3-135/1110-7-1 (FR*)

*System Documentation and Guidance*
- DCIS System Information
- DCIS User's Manual
- Standing Operating Procedures (SOPs) (for DCIS document input)
- Guidelines for Use of DA* Standard Designs

*FR=Fire Recovery; DA=Department of the Army.

The following menus are available in DCIS:

DCIS System Menu. The DCIS System Menu is perhaps the most important feature available to the DCIS read-only user. This function allows review of design criteria documents in the DCIS database. Using this menu the user can view AEIs on the computer's video display and print information necessary for future reference. Features associated with the System Menu allow the browsing and printing of documents by chapter, page, paragraph, or table or figure. One feature allows the user to view just the table of contents. The particular documents shown in the AEI Access Menu—a selection displayed on the System Menu—are based on the user's PAXID: the only documents listed are those that the PAXID is registered to access.

DCIS documents are revised frequently to include updated design criteria. Text that has been revised is denoted by an asterisk (*) in the first column of the AEI. Whenever a document is revised, the system informs the user via the AEI Change notification message. This message is displayed each time the document is accessed from the AEI Access Menu until the user has printed all revised pages.

Design Criteria AEI Menu. At the Design Criteria AEI Menu the user can browse or print documents. There are four options available in this menu: Browse, Speed Browse, Print, and Speed Print. The user can browse through the document and designate sections for printing later. Items that may be browsed include the AEI title page, foreword, table of contents, list of abbreviations and acronyms, appendixes, and individual chapters. The user is prompted to make desired selections. At the end of the browsing session, DCIS displays a message that helps the user correctly print any portions of the AEI he or she has selected.

The available browsing and printing options allow the user to optimize his or her time online by printing only selected passages or pages of an AEI (if that is all that is needed), or even just reading the criteria. With these options the user may minimize paper waste, hardcopy storage requirements, and PAX connect time (and its associated costs).

Bulletin Board Menu. Bulletins provide DCIS users with information on a variety of topics of interest. The Bulletin Board Menu lets the user both review and print the bulletins currently posted on DCIS.

*Suggestion Box*

The Suggestion Box feature, as mentioned previously, permits users to record and transmit comments to the System Monitor about DCIS documents, problems with the system, or related issues. When selecting this function, the user is placed automatically in the CMS system editor environment, where the suggestion is originated and filed. The suggestion is sent to the System Monitor's "virtual reader," a sector of memory where the suggestion can be stored for up to 5 days. The System Monitor retrieves these suggestions daily to review them, print them, or file them online. Using a function similar to the Suggestion Box, the System Monitor can then send responses back to the users.

Suggestions from users who have access to PAXMAIL are sent to the System Monitor via that route rather than the Suggestion Box.

*Printing*

When reading an AEI the user may mark pages to print later. The user may also specify pages to print without browsing or scanning the document.

*Audit Trail*

DCIS provides an audit trail that provides, as a minimum, the following information for use by the System Monitor: user PAXID, date of user access, information read, and number of times an AEI was accessed by the same user on the same date. It also files records in chronological order. The audit trail has been especially important during the development and testing of DCIS. Although the long-range purpose for the audit trail is to track AEI usage in general, its immediate purpose is to evaluate user acceptance.

The audit trail provides information not only to the System Monitor, but also to the user. When a user selects from the DCIS Document Menu, a "flag" may appear on the screen to tell the user that a change, update, or important message has been entered into DCIS since his or her last sign-on. The user may delete the flag, but it subsequently reappears each time the user again selects from the DCIS Document Menu. To stop the flag from reappearing, the user must select from menu item [1] through [6] on the Change Notification Menu.

Enhancements being developed for the audit function will track resource usage, provide detailed user access statistics for 1 month, summarize statistics for previous months, and perform the monthly summary and archiving. The enhanced audit function will also allow the user to print selected reports.

*System Information*

The DCIS System Information function provides an informative overview of DCIS. By accessing this option, the user can learn about the history, purpose, and functions of DCIS.

*Document Standards*

Due to the volume of the AEI database and the potential for adding other criteria to DCIS in the future, a set of standards for documenting design criteria has been formulated. Verification of these standards is in testing. Documents other than AEIs are added to the DCIS Document Menu through the System Monitor function.

*Documentation*

The *DCIS System Manual* contains time schedules, program logic, and program code that allows the ARA and proponent to develop a separable maintenance contract for the system. In addition to this documentation, a users' manual is also available, both in hardcopy format and for online access through the DCIS Document Menu.

## Potential Areas for Upgrade

*Graphics*

Considering the nature of AEIs and other design criteria, a capability for reading and reprinting drawings is considered desirable. However, research into the feasibility and cost-effectiveness of offering this capability must be conducted before work toward this end can be done.

*Hypermedia*

Although DCIS was conceived primarily as a vehicle for the most timely feasible distribution of AEI revisions to the end user, the system could potentially be greatly enhanced if it were revised into a hypermedia application. Possibilities for hypermedia integration into DCIS could include commercial design specification guides, drawings, and video images. In the preliminary stages of investigating the feasibility of conversion to hypermedia, the research team determined that the costs of applying hypermedia to DCIS in the near future would be prohibitive.

## Relationship to Other Design Criteria Sources

In addition to providing an online alternative to the conventional hardcopy edition of the Corps' AEIs, the information service provided by DCIS overlaps another widely used source of design criteria, the computer-based Construction Criteria Base (CCB). Developed by the U.S. Naval Facilities Engineering Command (NAVFAC), CCB is maintained and distributed by the National Institute of Building Sciences (NIBS). It is a quarterly subscription service designed to replace bulky hardcopy volumes of design criteria with a few standard CD-ROMs*, each of which holds the equivalent of 650 megabytes of data. The service includes up to four discs, depending on the number of criteria subscribed to. A number of Corps criteria and engineering documents are available on CCB, including AEIs, ETLs, engineering manuals and regulations, and guide specifications. Also available is a vast database of non-Corps criteria, including those published by NAVFAC, the Department of Energy, the Federal Aviation Agency, the National Aeronautics and Space Administration, and non-Government organizations such as NIBS and Building Officials and Code Administrators (BOCA®).

The obvious strong point of CCB is its comprehensive nature—it packs a vast amount of data into a very small package. This makes it useful for an office or library that needs such comprehensive data on file. However, CCB does not adequately address the problem of disseminating criteria updates directly to the end user in a timely manner, so DCIS and CCB should not be viewed as competing systems.

Despite their overlap in content, it can be seen that DCIS and CCB actually address two different needs of the Corps of Engineers, Army installations, and the A/E community. DCIS addresses timeliness and is designed for ready access by the end user; CCB addresses comprehensiveness and is targeted at repositories of construction design criteria.

Although CCB is updated quarterly—the same frequency as ETLs—there is a significant lead time required from the time an AEI revision is implemented until the information is digitally encoded on CD-ROM and distributed. Considering the frequency of CCB updates, a lag time of several months behind

*CD-ROM=compact disk-read only memory.

the published (offline) edition of the ETL may reasonably be expected. This lag time presents little problem for information that is not frequently revised, but for AEIs and ETLs it represents the same problem of timeliness that DCIS was designed to solve.

In addition to the timeliness factor, DCIS is also designed to be readily accessible by end users working on Corps-administered construction design projects. Any end user with a PAXID, a DOS-compatible microcomputer—even a laptop—and a modem can access DCIS anywhere in the world that has telephone service. To match the accessibility of DCIS, CCB would require each end user to have a CD-ROM drive nearby and a copy of the software; this investment could easily become excessive depending on how many A/Es needed access. Although DCIS users pay for connect time, mainframe time, and mainframe storage setup (optional), the system permits rapid access and retrieval of AEI data, so PAX costs need not be unduly high.

While CCB represents a great advance in the consolidation, storage, and distribution of design criteria, it cannot effectively be used as a substitute for DCIS. Neither can DCIS be considered a sole substitute for CCB, nor can either system be considered a substitute for the hardcopy published editions of the AEIs and ETLs. All are complementary sources of Corps AEI design criteria, each filling a different need for Corps A/E design personnel and private-sector firms working for the Corps on contract. However, DCIS is particularly important in the effort to avoid the time and money costs of using outdated design criteria on Corps-administered construction projects.

## 3 SUMMARY

Conventional publishing processes are not an effective, timely way to distribute Corps Architectural and Engineering Instructions or Engineer Technical Letters directly to the end user. The Design Criteria Information System was developed as an online means of distributing Corps design criteria—specifically AEIs and ETLs—in the most timely way feasible, with emphasis on making these criteria directly accessible to the end user. Its goal is to minimize the time and money costs that result when outdated design criteria are inadvertently used on a Corps-administered construction project. DCIS is a text-oriented system, but graphics compatibility is currently in development.

PAX, the host operating environment for DCIS, offers users ready access with its worldwide dial-in capability. This means the user can access DCIS from the office, at home, or on the road using conventional DOS-compatible microcomputer technology and a modem. With this system, the user can retrieve and store (or print) the most recent version of Corps AEIs with confidence that the criteria are up to date.

DCIS provides read-only access to most users, providing a safeguard against both accidental and deliberate corruption of system data. However, the System Monitor can grant a registered user of DCIS Document Maintainer access, which is required to write, change, or delete specified portions of DCIS records. This is the mode by which AEI updates are introduced online in a timely manner. In addition to this restricted provision for input, DCIS users in general are provided a Suggestion Box function that allows them to communicate questions, problems, and comments with the System Monitor. Suggestions are addressed directly by the System Monitor. All are reviewed and answered. Appropriate suggestions are earmarked for incorporation into DCIS as a system enhancement. Suggesters receive a response from the System Monitor even if their suggestions are not adopted.

Since AEIs apply to Corps-administered construction projects on a regional basis, the typical DCIS user has access only to AEIs pertaining to the region in which his or her project is located. The Corps' private-sector contractors may be granted even narrower read-only privileges, permitting access only to very specific parts of an AEI. These system characteristics are additional safeguards to the integrity of the data and the system.

DCIS menus have been standardized to help the user navigate the system. Additionally, AEI documents have been standardized in format to reduce variations in presentation, thus improving the overall clarity of design criteria data. Online documentation is available to help clarify system use. The various options for browsing and printing AEI documents give the user the flexibility and opportunity to minimize paper waste, hardcopy storage requirements, and PAX-related charges.

DCIS includes methods by which the user is alerted to AEI revisions and other items of interest. The user is notified by a "flag" displayed on the video screen when any changes are made to any AEI to which he or she has access. There is also a bulletin board facility for posting announcements of importance to DCIS users.

While DCIS content overlaps the content of the hardcopy editions of AEIs and ETLs as well as the NAVFAC-developed Construction Criteria Base, it is conceived as a complementary source of design criteria, not a competitor. DCIS excels at the timely dissemination of frequently revised design criteria directly to the end user. The system would be an appropriate channel for distributing any frequently revised text-based design criteria directly to the end user.

## APPENDIX: Tour of the DCIS Menu System

DCIS employs a multilayered system of menus that guides the user through the program to retrieve the information desired. This Appendix will take the reader through a typical series of commands that will bring up a list of AEI chapters available to read. A brief description of the thought process and keyboard commands will be given, followed by a printout of the associated DCIS screen display.

A word about menu organization will help clarify the material that follows. DCIS contains menus within menus. For example, the DCIS System Menu offers the user several options to select from, such as the Bulletin Board Menu and the DCIS Document Menu. Within the DCIS Document Menu the user is offered several more options. By choosing the AEI Selection Menu, for example, the user is given another selection of menus. If the Design Criteria AEI Menu is selected at that point, then the next set of menus will list AEI Access Menu as one of its options. At this point the user may directly view any AEI chapters that his or her PAXID is registered to access.

The above narrative may make navigation of the menu system seem tedious, but using the system is actually quick and easy. The menus function as a simple roadmap into the system. Furthermore, exiting the program is very quick and foolproof.

Since the DCIS user must be a registered PAX user, the following material assumes that the user has a valid PAXID. The screen shown below shows what the user will see once logged on:

```
          PAX SYSTEM MENU

1.   DESIGN CRITERIA INFO SYSTEM
2.   PAXMAIL
3.   PC DUGOUT
4.   UTILITIES

PLEASE ENTER --- 1 THRU 4 OR LOG

PAX>
```

It is possible to have as many as 22 menu items at this point, depending on the user's requirements. PAX is the host system for DCIS and many other applications.

From the preceding menu, the user would enter a [1] at the prompt: **PAX>**. The following screen would appear:

```
                    W E L C O M E
                        to the
          Design Criteria Information System
                  DCIS  Version 3.0

                  DCIS  System Menu
                  -----------------

              [1]  DCIS System Information
              [2]  Bulletins Menu
              [3]  Document Menu
              [4]  Suggestion Box

              [R]  Return to DCIS Environment Selection Menu
              [X]  Exit DCIS


        Please enter the Option ID of your choice.....
>
```

The DCIS menu starts to standardize here. Note the [**R**] and [**X**] options that are provided. These remain consistent throughout the system along with options [**C**] and [**E**], which appear further into the system. Also, it is important to note that the prompt is no longer **PAX>**. Within DCIS, the user will enter responses at >, which is a standard DOS prompt.

From the preceding menu, assume the user has selected [**3**]. The following information will be displayed:

```
          Design Criteria Information System
                  DCIS  Version 3.0

                  DCIS Document Menu
                  ------------------

          [A]    Architectural Engineering Instructions  (AEI)
          [D]    DA Standardization Program  (DA)
          [L]    Engineering Technical Letters  (ETL)
          [U]    DCIS User's Manual

          [R]    Return to DCIS System Menu
          [X]    Exit DCIS


      Please enter the Submenu Option of your choice.....
>
```

Note that both numbers and letters are used on DCIS menus. At this point [A] is selected.

```
Design Criteria Information System
          DCIS  Version 3.0

          AEI Selection Menu
          ------------------

[AEI]   - Design Criteria AEI
[MDS]   - Medical Design Standards AEI

[R]     Return to DCIS Document Menu
[E]     Exit to DCIS System Menu
[X]     Exit DCIS

Please enter the Document ID of your choice.....

>
```

Again, note that the [R], [E], and [X] options have remained constant. From level to level, menu options tend to alternate between single- and multiple-character entries. This enhances interface clarity by helping the user know which menu level he or she is currently at. It is not due to any programming limitation.

At this point the user would select [AEI]. If there have been any recent criteria revisions, the following message may be displayed:

```
   ********** Attention   Attention   Attention  ***********
 *                                                           *
 *  The AEI Document has been revised since you last printed it.  *
 *  Please use the options in the next menu to access the revised  *
 *  pages information.  When ready to continue, press [Return].    *
 *                                                           *
 *************************************************************

>
```

Upon hitting the return key the following is provided:

```
Design Criteria Information System
        DCIS  Version 3.0

     AEI Change Notification Menu
     ----------------------------

[1]  Print all revised pages
[2]  Print revised pages by chapter
[3]  Print revised pages by appendix
[4]  Print revised pages of other elements
[5]  Display revised pages list
[6]  Print revised pages list

[C]  Continue AEI Access

[R]  Return to AEI Selection Menu
[E]  Exit to DCIS Document Menu
[X]  Exit DCIS

Please enter the Option ID of your choice.....

>
```

The [C] option is used whenever there is a continuation option in addition to the exit prompts. At this point, assume the user ignores the change notification and continues in the program. In real-world use, this notification bulletin will flag the user in every subsequent DCIS session until the user takes an appropriate action. The message will automatically stop appearing after that action has been taken.

Entering [C] results in the following:

```
                Design Criteria Information System
                        DCIS  Version 3.0

                     Design Criteria AEI Menu
                     ------------------------

                    [1]  Browse
                    [2]  Speed Browse (Multiple Chapters & Appendices)
                    [3]  Print
                    [4]  Speed Print  (Multiple Chapters & Appendices)

                    [N]  Exit to Change Notification Menu
                    [R]  Return to AEI Selection Menu
                    [E]  Exit to DCIS Document Menu
                    [X]  Exit DCIS

              Please enter the Option ID of your choice.....

>
```

The user has several options to choose from when reviewing the document. In this sample run-through, assume the user selects [1]. The following menu is then displayed:

```
                Design Criteria Information System
                        DCIS  Version 3.0

                          AEI Access Menu
                          ---------------

                The following elements are available to you:

                       [1]  Title Page
                       [2]  Foreword
                       [3]  Table of Contents
                       [4]  Abbreviation and Acronyms
                       [5]  Chapters
                       [6]  Appendices

                       [R]  Return to Design Criteria AEI Menu
                       [E]  Exit to AEI Selection Menu
                       [X]  Exit DCIS


              Please enter the Option ID of your choice.....
>
```

As explained in the body of this report, certain geographic locations are not affected by some of the criteria. Where the criteria are not applicable, that Chapter may be excluded from the user's listing. When the user selects [5] (Chapters) the following message will appear with the appropriate listing for the current user:

```
You have authority to access the Chapters listed below.

CHAPTER 1.   GENERAL
CHAPTER 2.   ENVIRONMENTAL QUALITY
CHAPTER 3.   COMPREHENSIVE PLANNING AND SITING CRITERIA
CHAPTER 4.   PAVEMENT CRITERIA
CHAPTER 5.   BUILDINGS AND FACILITIES CRITERIA
CHAPTER 6.   ARCHITECTURAL CRITERIA
CHAPTER 7.   PROVISIONS FOR PHYSICALLY HANDICAPPED INDIVIDUALS
CHAPTER 8.   STRUCTURAL CRITERIA
CHAPTER 9.   FIRE PROTECTION CRITERIA
CHAPTER 10.  PROTECTIVE DESIGN CRITERIA
CHAPTER 11.  ENERGY CONSERVATION CRITERIA
CHAPTER 12.  ELECTRICAL CRITERIA
CHAPTER 13.  AIR-CONDITIONING, DEHUMIDIFICATION, EVAPORATIVE COOLING,
             HEATING, MECHANICAL VENTILATION, AND REFRIGERATION
CHAPTER 14.  ENERGY SOURCE SELECTION AND CENTRAL HEATING CRITERIA
CHAPTER 15.  PLUMBING EQUIPMENT CRITERIA

                Please enter a Chapter Number or QQ to quit.
>
```

At this point, when the user selects a number, the chapter of interest will be displayed on-screen. This is the lowest level of submenus available on DCIS. Note that the standard [R], [E], and [X] are not present here. The user will either review design criteria or quit. The Quit option takes the user back to the AEI Access Menu.

## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| AEI | Architectural and Engineering Instruction |
| A/E | architect/engineer |
| AR | Army Regulation |
| ARA | assigned responsible agency |
| CCB | Construction Criteria Base |
| CMS | Conversational Monitor System |
| CONUS | continental United States |
| DA | Department of the Army |
| DCIS | Design Criteria Information System |
| DOD | Department of Defense |
| ETL | Engineer Technical Letter |
| FOA | field operating activity |
| FS | Facility Systems Division (USACERL) |
| FR | Fire Recovery |
| HQUSACE | Headquarters, U.S. Army Corps of Engineers |
| IBM | International Business Machines Corp. |
| MACOM | Major Army Command |
| MDS | Medical Design Standards |
| MPAT | Military Programs Analysis Team |
| MSC | major subordinate command |
| NAVFAC | Naval Facilities Engineering Command |
| OCONUS | Outside the Continental United States |
| PAX | Programming, Administration, and Execution system |
| PAXID | PAX user identification |
| SOP | standard (or standing) operating procedure |
| USACE | U.S. Army Corps of Engineers |
| USACERL | U.S. Army Construction Engineering Research Laboratory |

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